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ABSTRACT

The first six instructional blocks in automotive mechanics, the lessons and supportive information in the document provide a guide for teachers in planning an instructional program in the basic theory and practice of a beginning course at the secondary and post-secondary level. The material, as organized, is a suggested sequence of instruction within each block. Each lesson is stated in terms of a specific teaching objective, teaching aids, references, and an outline of information. Upon completion of the 20 lessons in the introductory block, students will be able to: (1) examine the field of occupations within the mechanic service industry, (2) recognize the scope of the automotive industry as a major socio-economic factor in our lives, (3) plan a tentative schedule of study, based on the available curriculum, (4) function within the established school and program organization, and (5) define and perform essential services classified as general vehicle maintenance. Included with the course outline are transparency masters and a reference guide listing related books, texts, and other publications. (MW)

ED 098401

AUTOMOTIVE MECHANICS INSTRUCTIONAL PROGRAM

BEST COPY AVAILABLE

BLOCK I

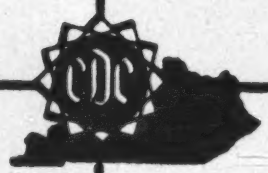
Orientation

PREPARED FOR

Kentucky Industrial Education Teachers

IN COOPERATION WITH

Bureau of Vocational Education
State Department of Education
Frankfort, Kentucky



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INTRODUCTION

Vocational and technical education programs in Kentucky are organized and operated to provide students with maximum opportunity to acquire the necessary competencies for entry-level employment and future career success.

Modern classrooms and laboratories are designed to accommodate programs in settings similar to representative occupations while equipment and tools are selected, organized, and utilized to reflect commercial and industrial standards.

Teachers for trade and industrial programs are recruited from the ranks of industry and business where they have acquired the technical expertise necessary to qualify them for their instructional assignments. This invaluable experience, combined with professional education and inservice preparation, enables trade and industrial teachers to effectively relate instruction to modern occupational standards.

Well-planned curricula and materials prepared to support instruction are of prime importance in maintaining quality educational programs. As technology in a given field changes and expands, it is important to update curricular materials.

The lessons and supportive information in this volume are designed to provide a guide for teachers in planning instructional programs in the basic theory and practice of a beginning course in automotive mechanics.

The material, as organized, is a suggested sequence of instruction within each block. Objectives, generally stated in terms of student performance, are offered at the beginning of each block, while specific teaching objectives, suggesting student performance, accompany each lesson.

In using this guide, the teacher may find it necessary to restate objectives, rewrite and update lessons, adjust instructional format, change page sequences, and add or delete content wherever necessary to reflect appropriate instructional goals and individual student needs.

Instruction will be enhanced as the teacher supplements this course with reference material from technical publishers, and with manufacturers' manuals, charts, diagrams and other guides.

An important element in effective teaching is regular advance planning for each phase of instruction presented. It will be necessary to adapt this material to local needs and instructional methods.

ACKNOWLEDGMENTS

A philosophy often proposed by learning strategists is that curriculum materials designed to support the teaching effort will be more meaningful and find wider application if practicing teachers have direct influence on their design and content.

All automotive mechanics teachers in Kentucky's public vocational schools have contributed to the preparation of this volume. Without their input, its completion would not have been possible.

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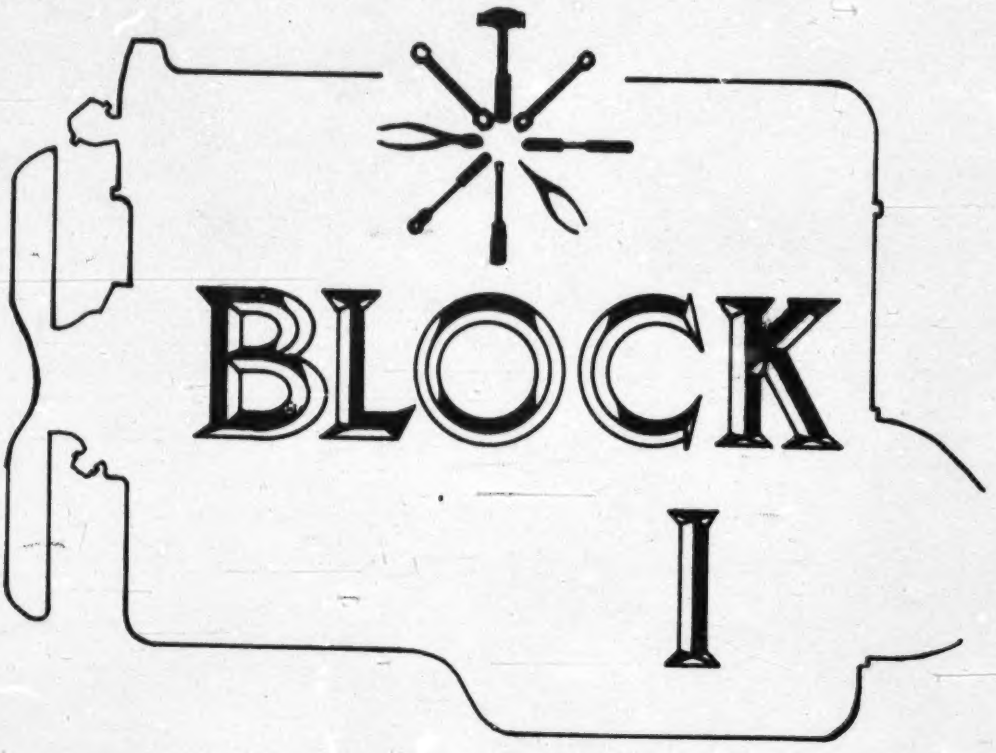

Orientation

General Teaching Objectives

Upon completion of the twenty lessons in this introductory block, students will be able to:

1. Examine the field of occupations within the automotive mechanic service industry and select, for study, an occupational category specifically related to individual career interests.

2. Recognize the scope and importance of the automotive industry as a major factor in the socio-economic structure in the United States.

3. Plan a tenative schedule of study, based on the available curriculum, that will prepare one for entry into his chosen occupational category. This must be planned under the guidance of the instructor.

4. Plan, as a student, to profit academically from the instructional program by functioning within the established school and program organization.

5. Define and perform basic essential services so classified as general vehicle maintenance.

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INFORMATION

Block: Orientation

Lesson: History of the Automobile

Block I
Job
Lesson

Teaching Objective: Upon completion of this lesson, students will be able to briefly describe key points of development and progress of the automobile industry.

Teaching Aids: Booklets:
- The Automobile Story, General Motors Corporation
- Transportation Progress, General Motors Corporation

References: Automotive Mechanics, Crouse, Chapter 1

Outline of Information:

1. The automobile is a self-propelled wheeled vehicle primarily designed for transportation.

2. Forms of energy for propulsion purposes

   a. The first steam engine was developed by a Frenchman, Nicholal Cugnot, in 1796.
      -- It was experimentally used to propel a crude vehicle that achieved a top speed of three miles per hour.

   b. Two Englishmen developed a steam propelled vehicle that could reach a speed of 15 miles per hour but was doomed due to the passage of the Red Flag Act in 1836.

   c. The electric car was built by an American, Thomas Davenport, in 1834.

   d. The first internal combustion engine was built by Joseph Lenior of France in 1863.

      NOTE: Refer to lesson, "The Piston Engine," p. II-5.

   e. The first successful gas operated car to be built in the United States was built by Charles and Frand Duryea in 1893.

   f. The next five years involved several other American inventors.
      -- Elwood Haynes
      -- Jonathan Maxwell
      -- The Apperson Brothers
      -- Charles King
      -- Henry Ford
      -- Alexander Winton
      -- Eli Olds

History of the Automobile (continued)

3. Mass production in the 20th century

   a. Cheaper

   b. Available to more people

4. Bodies patterned after horse drawn carriages

   a. Service was poor
      -- Blacksmith did most of the frame repairs.
      -- Tin smith did the sheet metal repairs.
      -- Cabinet-maker or carpenter made the wooden parts.

   b. Beginning of the auto body and fender repair trade
      -- Tools crude and awkward

5. The thirties brought the change from square box design to the streamline effect that is still in use today.

   a. Wooden parts eliminated

   b. Styles change more frequently

6. In the late forties and early fifties, problems developed.

   a. Skilled labor shortage

   b. Materials shortages

   c. Foreign imports

INFORMATION

Block: Orientation

Block I
Job
Lesson

Lesson: Auto Mechanics Class Management Within the School Organization

---

Teaching Objective: Upon completion of this lesson, students will be able to successfully function within the automotive class organization relative to school policies.

Teaching Aids: School Policy Guide
Teacher's Handbook
Student Handbook

References: Managing Multiple Activities In Industrial Education, Silvius and Curry, Chapters 5, 16, 25, 26, 27

Outline of Information:

1. The success of an organization depends on a sound structure.

   a. Leadership
      -- Class responsibility with members
      -- Ability to follow directions
      -- Cooperation with school personnel and fellow students

   b. Two types of student organizations
      -- Moniter system
         (1) Duties divided among students
         (2) Class responsibilities rotated
      -- Student directed
         (1) Conformity of officer's (manager's) assignments to personnel within occupation
         (2) Need for substitute officers
         (3) Need for teacher evaluation

2. Management concerns are similar to those within occupation.

   a. Shop organization
      -- Shop rules
      -- Shop layout
      -- Distribution and storage of materials
      -- Broken tools or equipment
      -- Evaluation
      -- Live work
      -- Accidents
      -- Clean up
      -- Tool room
      -- Progress charts
      -- Individual responsibility

b. School policies
   -- Administration
   -- Class hours
   -- Absence
   -- Breaks
   -- Smoking
   -- Discipline
   -- Evaluation
   -- Grade reporting system
   -- Cooperative education
   -- Job placement
   -- Guidance

3. Instructor responsibilities in class organization

a. Instruction
   -- Course format
   -- Technical and related content
   -- Guidance
   -- Shop management
   -- Administrative laison
   -- Equipment operation
   -- Shop security

b. Evaluation (as an instructional responsibility)
   -- Technical knowledge
      (1) Written examinations
      (2) Oral and written reports
      (3) Vehicle systematic diagnostic reports
      (4) Group projects
      (5) Student instructional ability
   -- Manipulative skills
      (1) Competency tests (performance)
      (2) Effeciency
      (3) Accuracy
      (4) Care and use of tools and equipment
   -- Observable judgements
      (1) Attitude
      (2) Appearance
      (3) Cooperation
      (4) Respect for property
      (5) Respect for authority
      (6) Problem solving ability

INFORMATION

Block: Orientation — Block I
Job
Lesson: Automotive Occupational Information — Lesson

Teaching Objective: Upon completion of this lesson, students will be able to relate the employment characteristics of the automobile mechanics occupation with other occupations that they have considered and with their personal career aspirations.

Teaching Aids: Charts:
- Automobile Progress, General Motors Corporation
- Automotive Service Job Opportunities, Automotive Service Industry Association

Film:
- Occupation: Auto Mechanic, General Motors Corporation

References: Occupational Outlook Handbook, United States Government Printing Office
Occupations and Careers, Feingold and Swerdloff,
Automotive Service Occupations, United States Government Printing Office
John Leveron, Auto Mechanic, Follet Publishing Company

Outline of Information:

1. Facts about the automotive industry

   a. Employment outlook
      -- In 1970 600,000 mechanics were employed.
         (1) Most of these were employed in independent repair shops as specialized or general mechanics.
         (2) A small number were employed by department stores and chain stores.
         (3) Many are employed by new car dealers.
         (4) The average shop employs from one to five mechanics, but some of the largest shops employ more than one hundred.
         (5) Each year, as replacements, 8,600 jobs are expected.

   b. Earning and working conditions
      -- Salaries averaged $3.62 - $6.13 across the country in late 1969.
      -- General mechanics and specialists generally earn more.
      -- Some mechanics are paid a commission. Usually 50% of the labor cost is charged to the customer.
      -- Many employers provide paid vacations, insurance and retirement and laundered uniforms.
      -- Generally the mechanic's work is performed indoors in well lighted, heated and ventilated areas.
      -- Minor cuts and bruises are common.
      -- Serious accidents are avoided by practicing safety rules.
      -- In larger cities some mechanics may be members of labor unions.

2. Mechanic education

   a. Most mechanics learn the trade through "on-the-job" experience.

   b. Trainees usually start in service stations as helpers, lube men or attendants.

   c. About four years is required to learn the trade on the job, with 1 1/2 to 2 years required for specialization.

   d. Considerable amount of training is available in the military services.

   e. Others receive training in vocational and trade schools.
      -- Work study programs
      -- Co-op programs
      -- Full time vocational student
      -- Factory sponsored alternately working 6 months and studying six months (relatively new)

   f. Opportunities
      -- High school completion is preferred for job entry.
      -- Mechanics own their own hand tools and beginners are expected to accumulate them as they gain experience.

3. Advancement possibilities

   a. Experienced mechanics are continually being upgraded by attending factory schools and clinics.

   b. Experienced mechanics are advanced to:
      -- Shop foreman
      -- Service manager
      -- Garage ownership
      -- Automotive mechanic instructor

INFORMATION

Block: Orientation

Block I
Job
Lesson

Lesson: Personal Attributes that Contribute to Occupational Success

---

Teaching Objective: Upon completion of this lesson, students will be able to relate personal attitudes pertaining to working habits and practices to accepted standards within the automotive mechanics occupation.

Teaching Aids: Booklets:
- Can I Get the Job?, General Motors Corporation
- Can I Be a Craftsman?, General Motors Corporation
Film:
- Matter of Responsibility, General Motors Corporation

References: Occupations and Careers, Feingold and Swerdloff, Chapters 2,3

Outline of Information:

1. Competency

   a. Degree of skill should equal or surpass job level

   b. Quality of service provided must always be of highest standards

   c. Willingness to keep abreast of changing technology is essential

2. Efficiency

   a. All services to be performed with mininum amount of working time

   b. Utilization of skillful processes as accepted standards within the occupation

   c. Shortcuts that neglect highest standards to be avoided

3. Integrity

   a. Effective understanding and application of sound and honest business practices
      -- Use of only quality parts, materials and processes on customer's vehicle
      -- Assurance of complete customer satisfaction
      -- Repair and/or replace to assure best economy and ultimate vehicle safety
      -- Adherance to fair pricing standards

   b. Respect for honest competition
      -- Refer customer to proper source of service

Personal Attributes that Contribute to Occupational Success (continued)

4. Personal characteristics and work habits

   a. Cleaniness and grooming
      -- Individual
      -- Clothes or uniform
      -- Concern for personal appearance

   b. Respect for others
      -- Honesty
      -- Sincerity
      -- Friendliness (Courtesy)

   c. Working environment
      -- Clean work area
      -- Tools and equipment
         (1) Organized and accounted for
         (2) Clean and in proper working order
      -- Storage areas
         (1) Uncluttered
         (2) Safety precautions
         (3) Fire hazards
      -- Parts (new and used)
         (1) Appropriate
         (2) Inspected, cleaned

INFORMATION

Block: Orientation

Lesson: Safety

Block 1
Job
Lesson

Teaching Objective: Upon completion of this lesson, students will relate general concerns for safe practices to the working environment of the school shop.

Teaching Aids: Posters:
- School Shop Poster Packet, National Safety Council
Slides:
- Think First Aid, National Safety Council

References: Accident Prevention Program for School Shops, National Safety Council
Industrial Education Shop Planning Packet, Powermatic Division
Managing Multiple Activities in Industrial Education, Silvius and Curry, pp. 200, 310-317

Outline of Information

1. Safety as an attitude

   a. Concern for personal safety
      -- Injury and disability
      -- Lost time and wages

   b. Awareness and concern for others
      -- Other students, employees, customers

   c. Safety an integral concept in working organization
      -- Total awareness for safety to be acquired and practiced

2. Safety habits

   a. Conduct
      -- Working responsibility of serious concern

   b. Clothing
      -- Appropriate for shop working conditions

   c. Protective wear
      -- Goggles, shoes, gloves

   d. Smoking
      -- Only when and where permitted

Safety (continued)

e. Emergency knowledge
   -- Fire precautions and equipment
   -- First aid and care

3. Conditions essential to safety

a. Storage of materials
   -- Inflamable
   -- Combustible

b. Condition and use of materials and equipment
   -- Electrical
   -- Mechanical
   -- Combustible
   -- Vented equipment and areas

c. Cleanliness
   -- Grease and oil spills
   -- Working area
   -- Uncluttered aisles

d. Movement of vehicles
   -- Clean areas
   -- Alert personnel

Block: Orientation

Lesson: Customer Service

Block 1
Job
Lesson

Teaching Objective: Upon completion of this lesson, students will be able to discuss and relate the basic essentials that influence customer relations.

Teaching Aids: Filmstrip:
- Nine Point Selling Plan, Chrysler Corporation

References: Owner Relations Action Guide, General Motors Corporation
Building a Future in a Business of Your Own, American Petroleum Institute
The Costs of Running a Car, Grolier Educational Corporation, 1970

Outline of Information:

1. How to approach and relate to customers

   a. Importance of sincere, friendly attitude

   b. Introductions and identification of position and duties

   c. Listening carefully to customer's concerns and questions

   d. Remembering specific personal or problematic customer characteristics
      -- Mental notes, names, kind of vehicle, etc.

   e. Provide clear, concise, accurate answers to customers
      -- Services, repairs, alternatives
      -- Costs, credit, terms, etc.
      -- Diagnosis
      -- Safety, hazards, remedies
      -- Workmanship, warranties, guarantees

2. Customer education

   a. Periodic service
      -- Life of vehicle
      -- Safe operation
      -- Efficient operation
      -- Conditions of vehicle use
         (1) Normal
         (2) Severe, fleet, commercial

b. Care of vehicle not in regular use
   -- Storage
   -- Tires
   -- Engine
   -- Battery

c. Inspection regulations
   -- Legal requirements
   -- Licensing
   -- Safety

3. Customer complaints

   a. Responsibility of service manager

   b. Importance of etiquette

   c. Avoiding disagreements

   d. Fact finding and assessment

   e. Corrective measures

   f. Follow up and customer satisfaction

Block: Orientation

Lesson: Hand Tools

Block 1
Job
Lesson

Teaching Objective: Upon completion of this lesson, students will be able to identify and classify, according to use, the common hand tools and devices necessary for basic mechanical service and repair.

Teaching Aids: Transparencies:
-- pp. I-18 through I-30

References: Automotive Mechanics, Crouse, Chapter 2

Outline of Information:

1. Common hand tools

   a. Hammers
      -- Striking
      -- Driving
      -- Forcing
      -- Crimping
      -- Swedging

   b. Pliers
      -- Gripping
      -- Crimping
      -- Cutting
      -- Bending
      -- Stripping
      -- Ringing

   c. Screwdrivers
      -- Tightening
      -- Loosening

   d. Wrenches and accompanying devices
      -- Adjusting
      -- Tightening
      -- Loosening
      -- Torquing

   e. Chisels
      -- Cutting
      -- Loosening
      -- Splitting
      -- Notching
      -- Shearing
      -- Grooving
      -- Spreading

f. Punches
   -- Center punching
   -- Driving
   -- Pinning
   -- Swedging
   -- Spreading
   -- Marking (identifying)

2. Hand tool classification by use

a. Cutting tools
   -- Hacksaw and blades
   -- Tubing cutter
   -- Threading tools
      (1) Taps
      (2) Dies
   -- Files (many types, styles and special uses)
   -- Drill bits
   -- Reamers

b. Abrasive tools
   -- Sharpening stones
   -- Abrasive cloths and papers
   -- Hones
   -- Abrasive wheels (special use carborundum bits)

c. Measuring tools
   -- Scales
   -- Screw pitch gauges
   -- Feeler gauges
   -- Wire gauge
   -- Calipers
   -- Squares
   -- Micrometers
   -- Hole gauges
   -- Telescoping gauges
   -- Radius gauges
   -- Indicators

d. Marking tools
   -- Scribers
   -- Awls
   -- Dividers
   -- Trammels

e. Holding devices
   -- Vices
   -- Clamps
   -- Chucks
   -- Drill motors
   -- Diestocks
   -- Tap wrenches

f. Special tools
   -- Extractors
   -- Crimping tools
   -- Riveting tools
   -- Gear pullers
   -- Soldering tools

NOTE: It is recommended that the teacher plan for introducing the study of classification, uses, care and maintenance of hand tools in a rather brief general manner, early in a beginning program. However, it will be necessary to add depth to these topics as specific and appropriate needs arise during the course progression.

INFORMATION

Block: Orientation

Block I
Job
Lesson

Lesson: Care of Tools and Equipment

Teaching Objective: Upon completion of this lesson, students will be able to determine the importance of proper care of automotive shop tools and equipment.

Teaching Aids: Movie (16mm):
- The ABC of Hand Tools, General Motors Corporation

References: Shop Planning Packet, Powermatic Company
Automotive Mechanics, Crouse, Chapter 2

Outline of Information:

1. Regular maintenance is essential. The American industrial system has flourished because of its regularity of service and maintenance.
   a. Daily
   b. Weekly
   c. Monthly
   d. Semi-annually
   e. Annually
2. Keep tools and equipment clean.
   a. Lubrication
   b. Assessment, adjustment
   c. Repair, replacement
3. Use of equipment requires familiarization and skill.
   a. Directions
   b. Safety
   c. Specifications
   d. Limitations
   e. Alternatives

4. Tools and equipment must be stored properly when not in use.

   a. Protection
      -- From deterioration, corrosion
      -- From theft, tampering

   b. Safety

   c. Orderly
      -- Appearance
      -- Working area

5. Procedures to follow when a tool or piece of equipment is broken

6. Procedures for regulating the use of tools and equipment

   Note: Refer to management policies for the use, repair and replacement of tools and equipment.

7. Tools and equipment costs

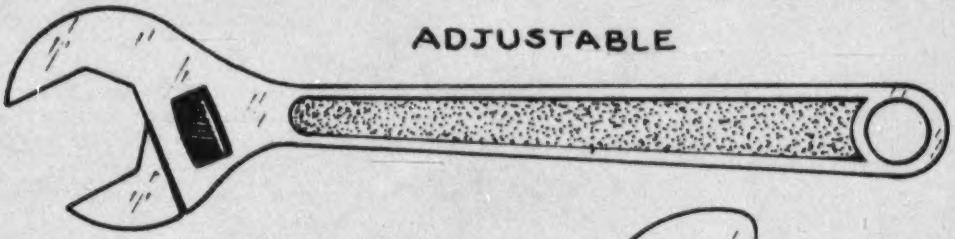
   a. Wear and obsolescence

   b. Breakage

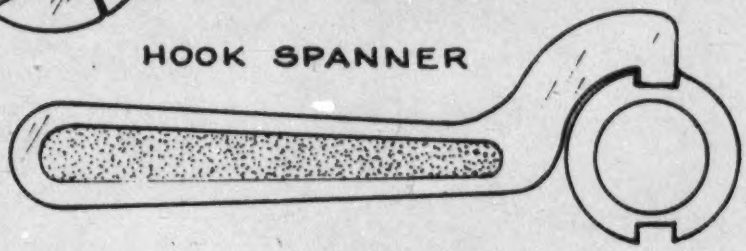
   c. Loss

HAND WRENCHES

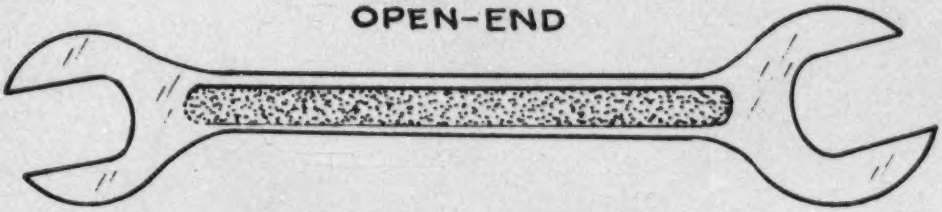
ADJUSTABLE



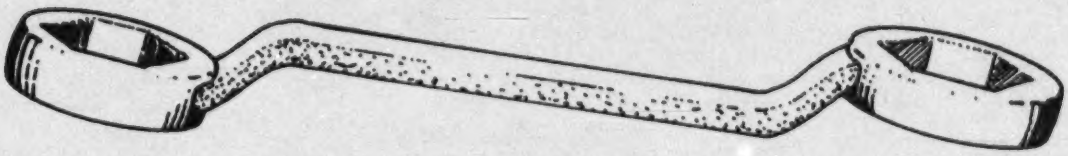
HOOK SPANNER



OPEN-END

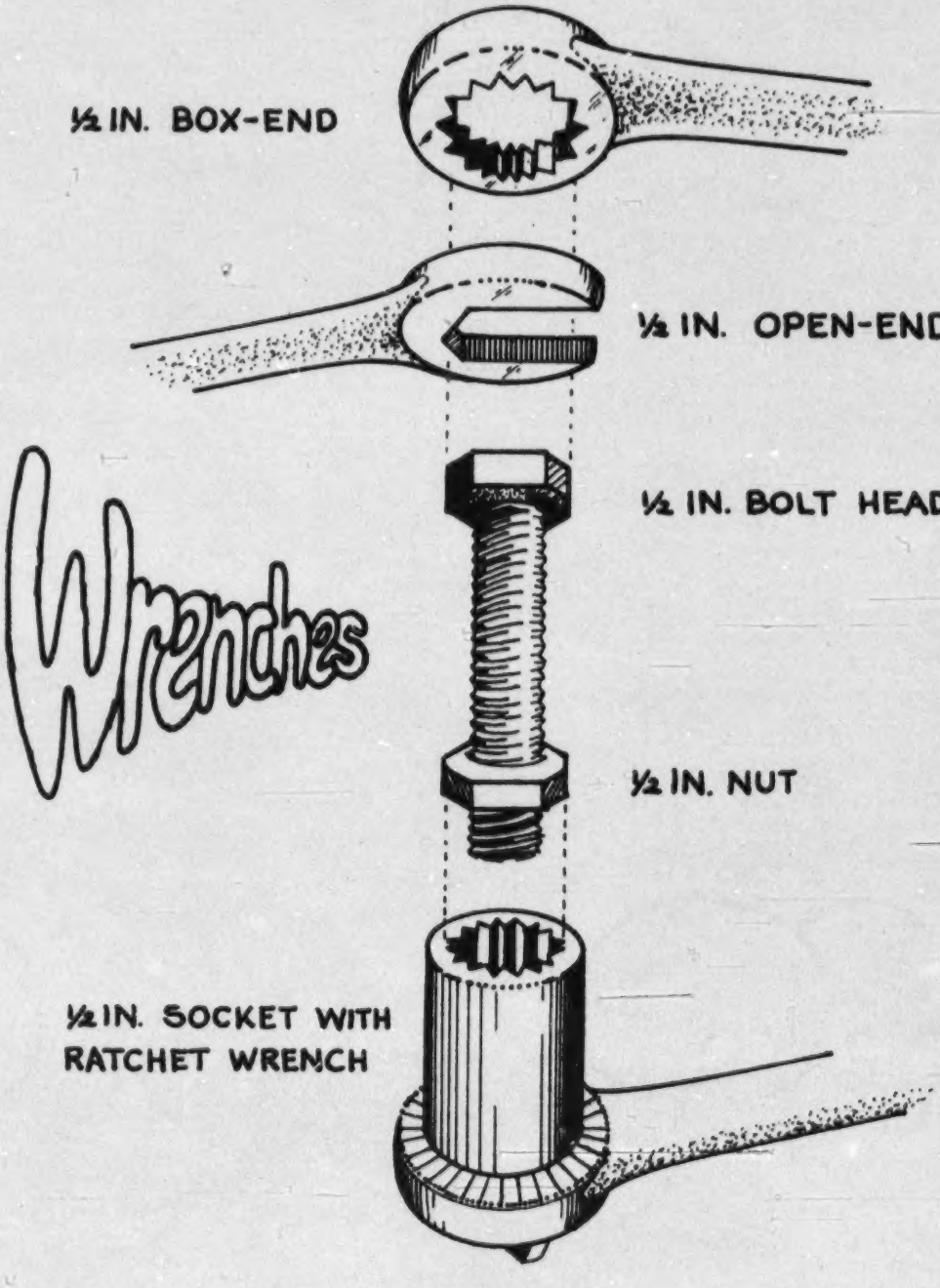


BOX

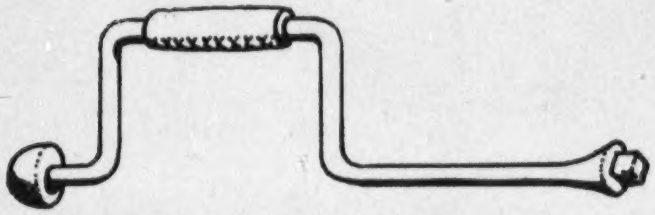


COMBINATION

Wrenches

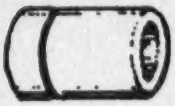

½ IN. BOX-END
½ IN. OPEN-END
½ IN. BOLT HEAD
½ IN. NUT
½ IN. SOCKET WITH RATCHET WRENCH

Wrench Sets



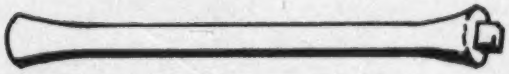
SPEED HANDLE

RATCHET

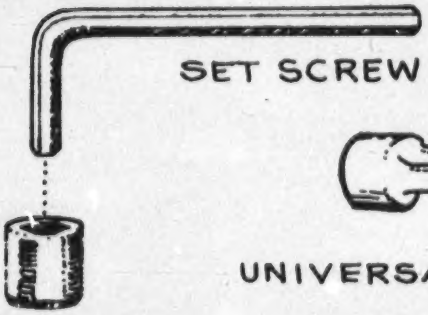


SOCKET

"T" HANDLE

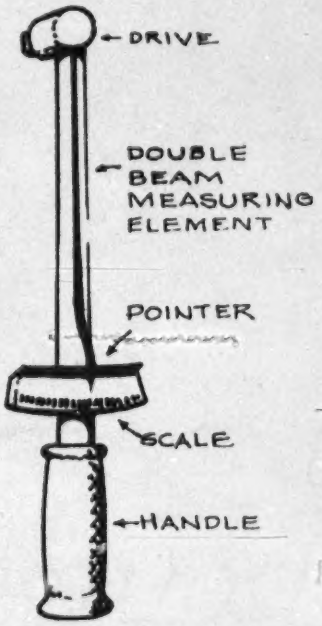


SOCKET EXTENSION



SET SCREW WRENCH

UNIVERSAL JOINT



TORQUE

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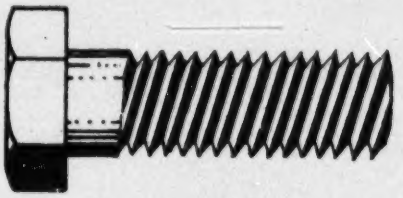
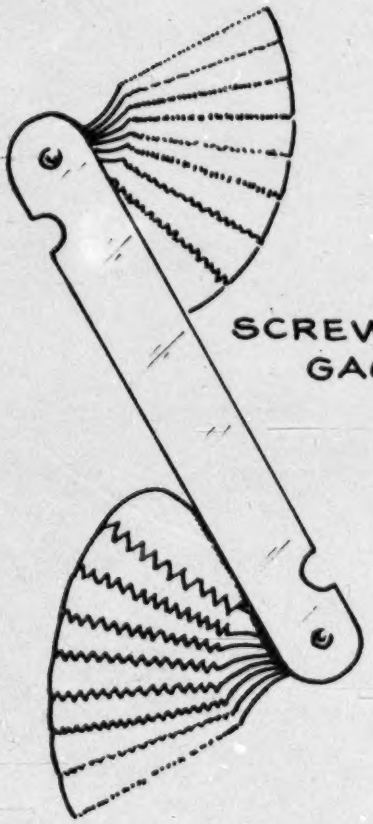
Machine Bolts

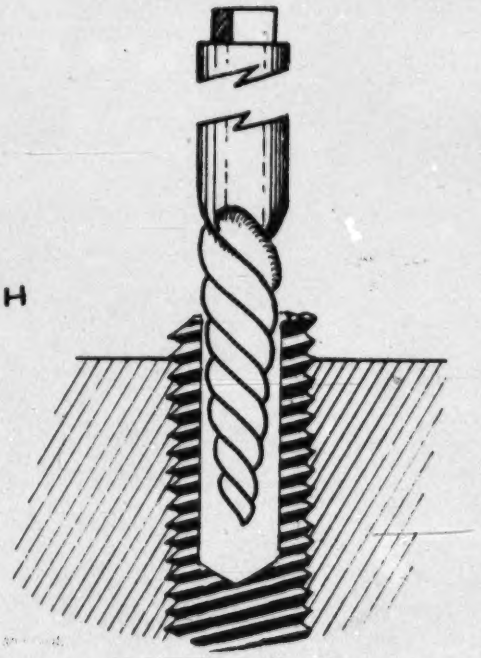
RIGHT HAND THREADS



LEFT HAND THREADS



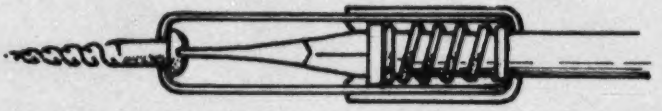
SCREW PITCH GAGE



SCREW EXTRACTOR

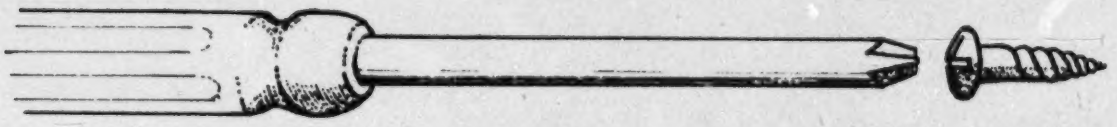
Screwdrivers

COMMON



SCREW-HOLDING DEVICE

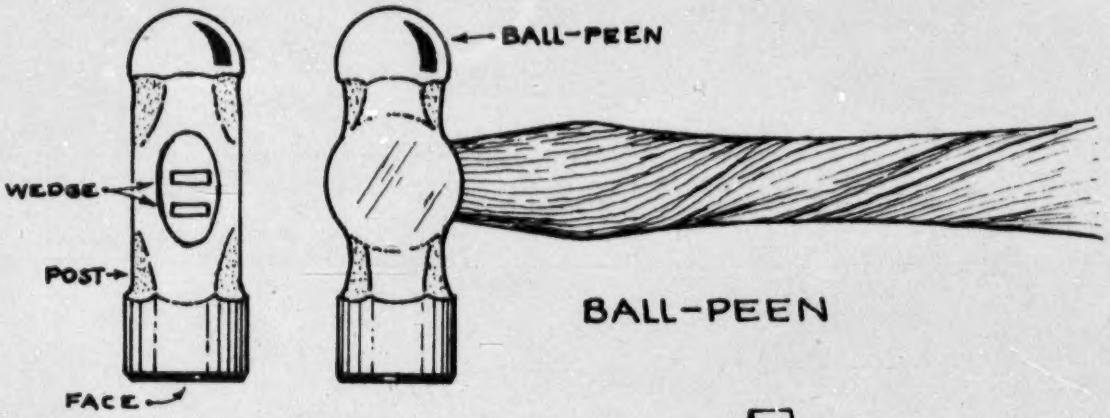
SPECIAL DRIVE-CLUTCH



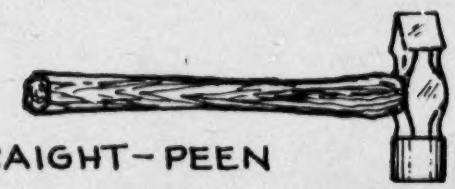
PHILLIPS-HEAD

OFFSET

Shop Hammers

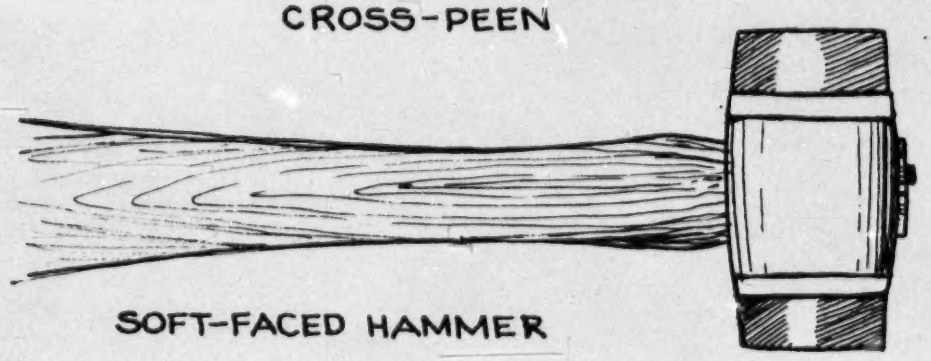


BALL-PEEN



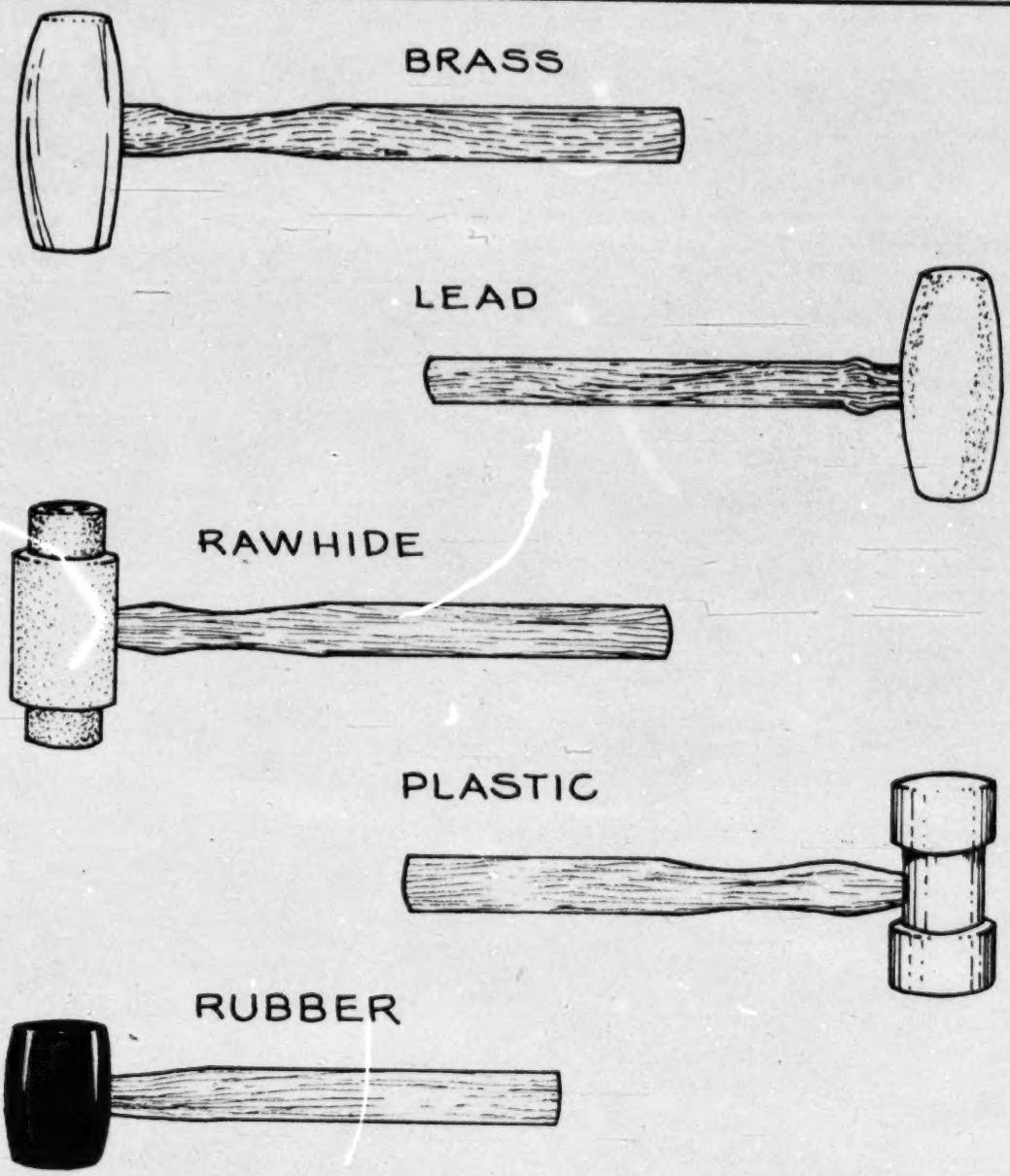
STRAIGHT-PEEN

CROSS-PEEN



SOFT-FACED HAMMER

Hammers for PROTECTING TOOLS, PARTS and FINISHES



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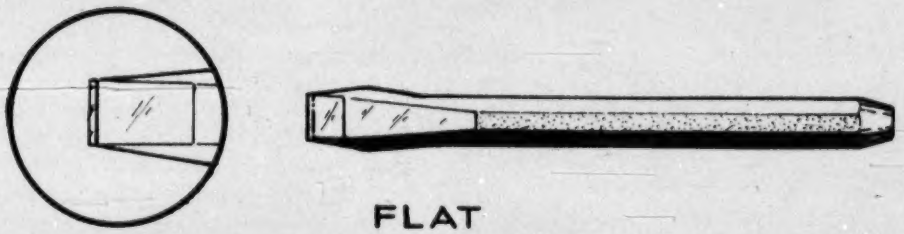
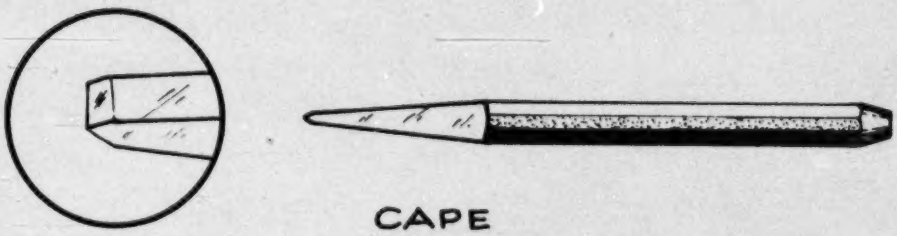
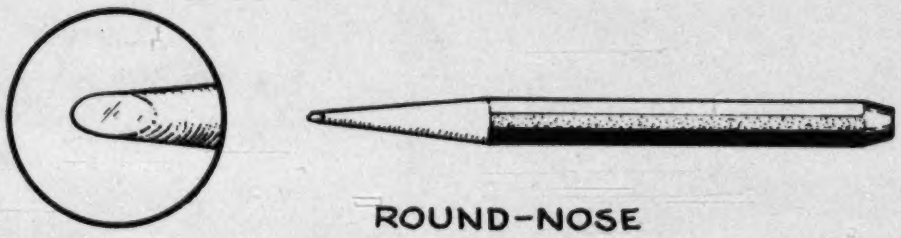
COLD CHISELS



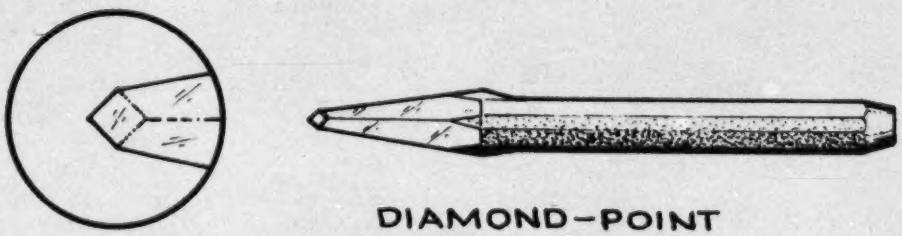
FLAT



CAPE

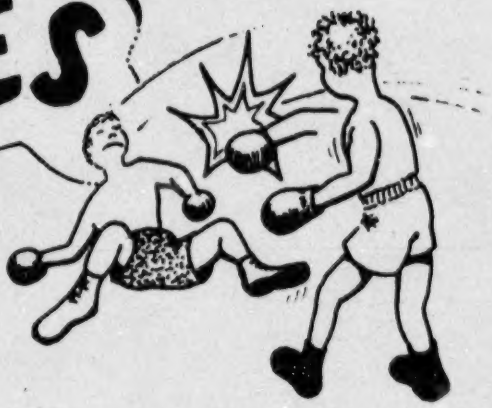


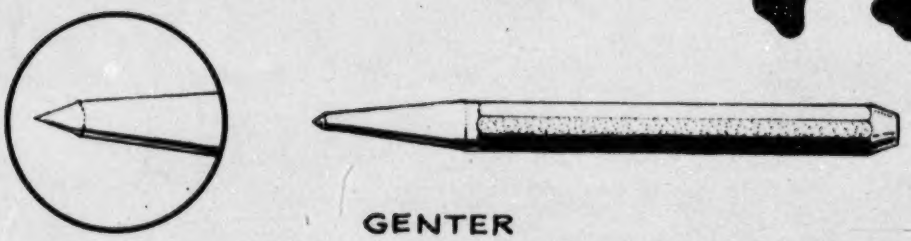
ROUND-NOSE



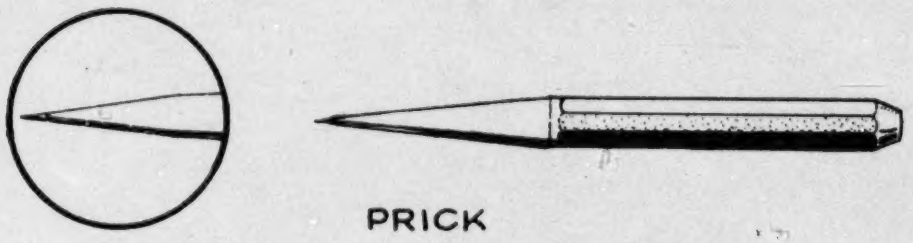
DIAMOND-POINT

PUNCHES

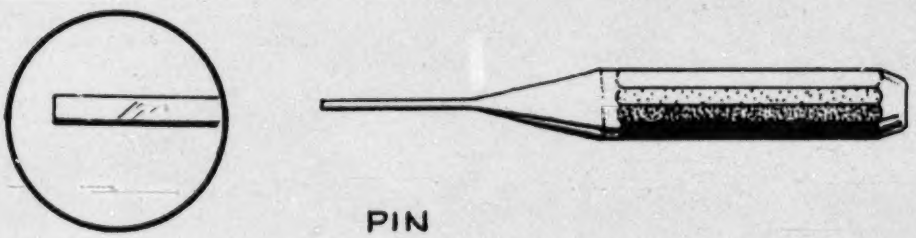




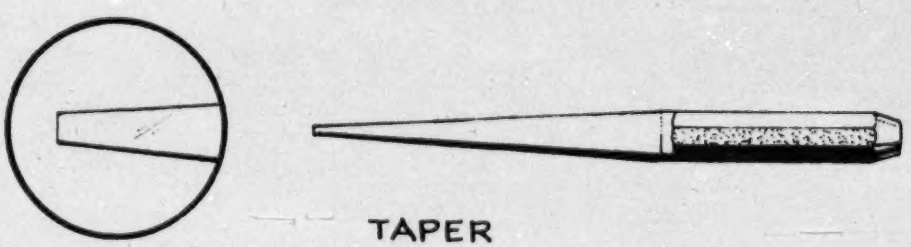
GENTER



PRICK



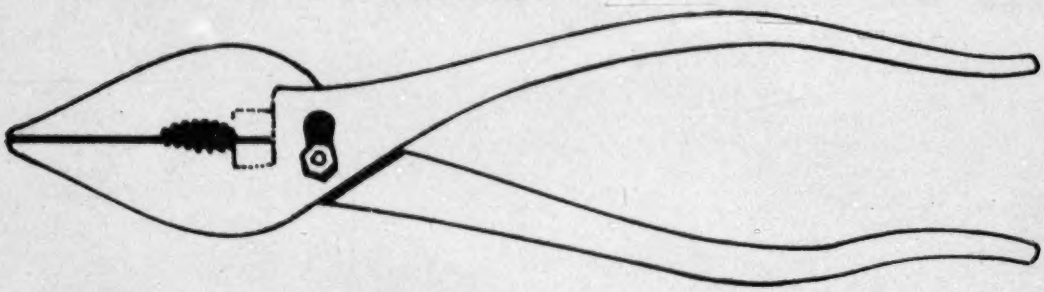
PIN



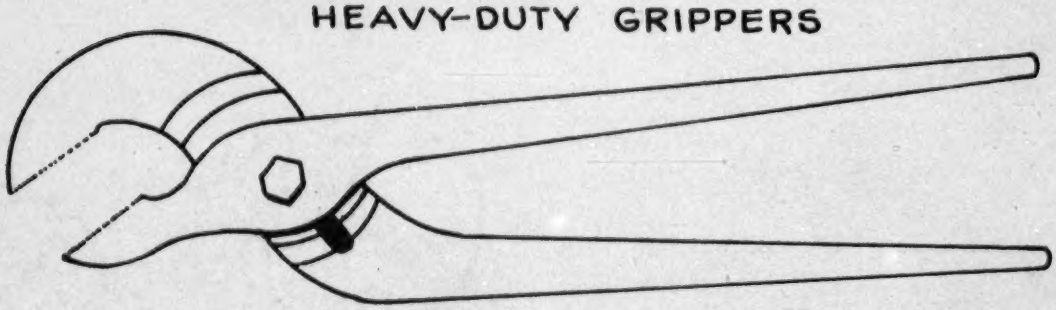
TAPER

Pliers

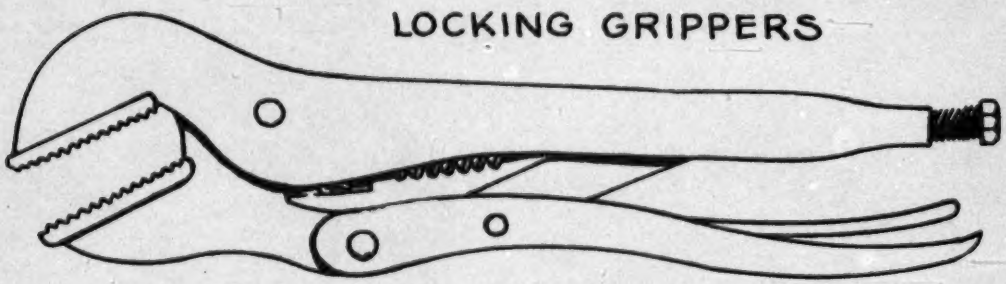
COMBINATION PLIERS



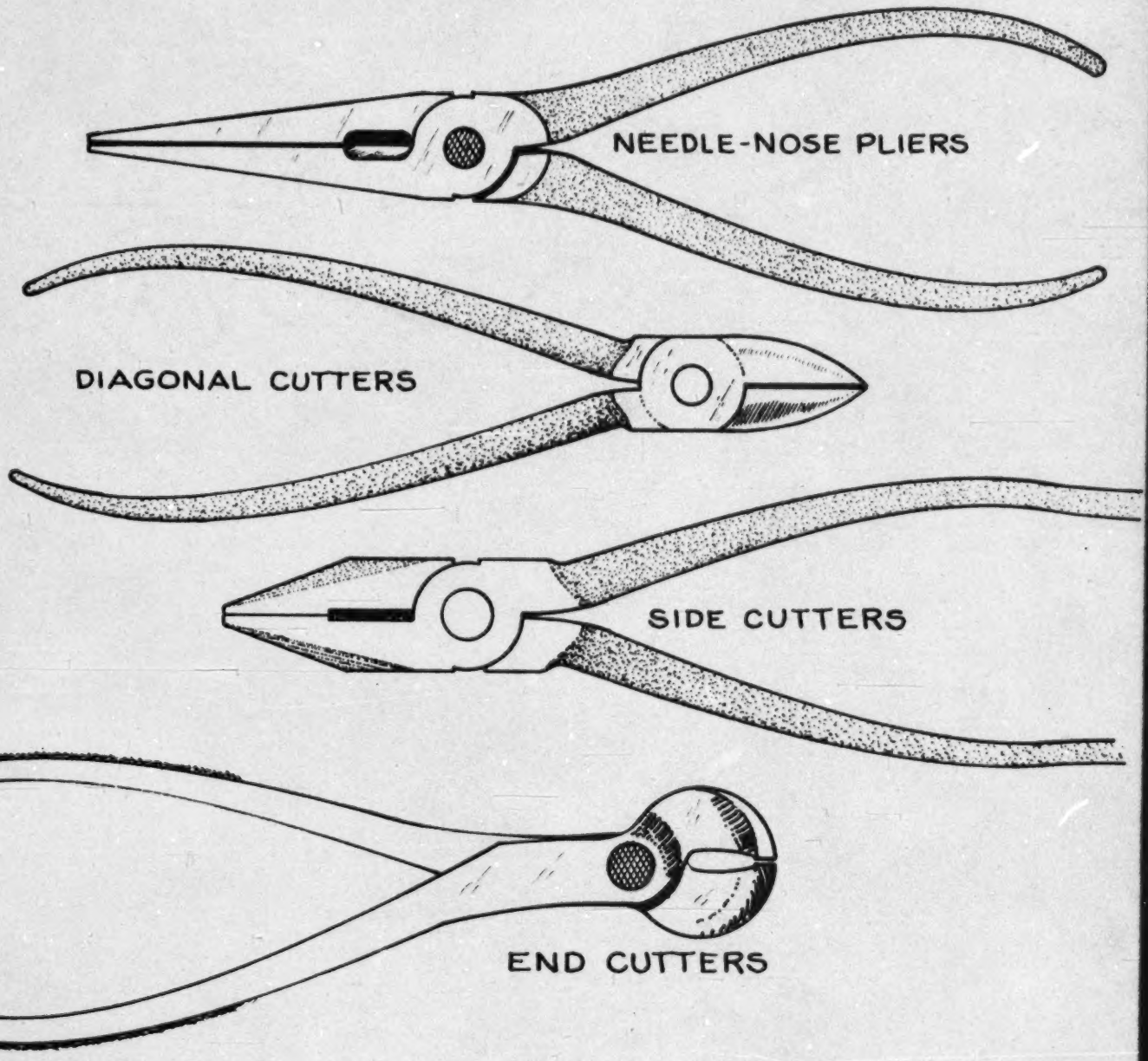
HEAVY-DUTY GRIPPERS



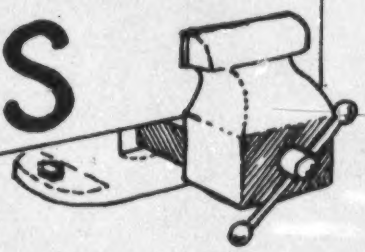
LOCKING GRIPPERS



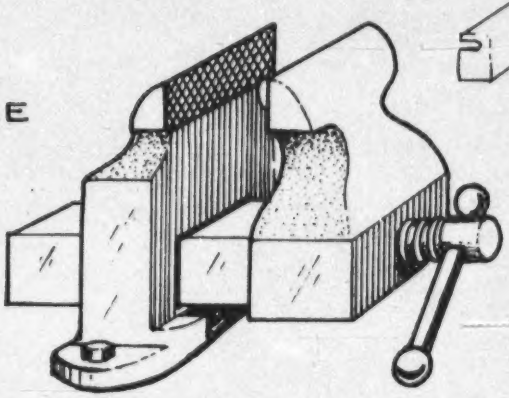
Pliers

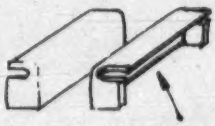

NEEDLE-NOSE PLIERS
DIAGONAL CUTTERS
SIDE CUTTERS
END CUTTERS

HOLDING DEVICES

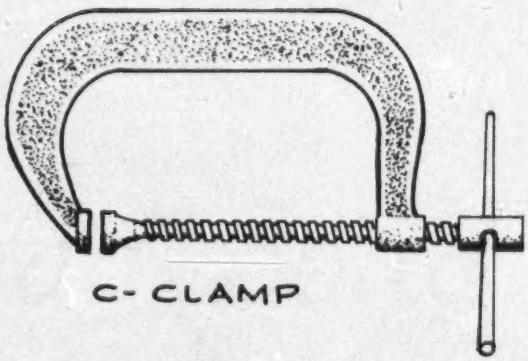


BENCH VICE

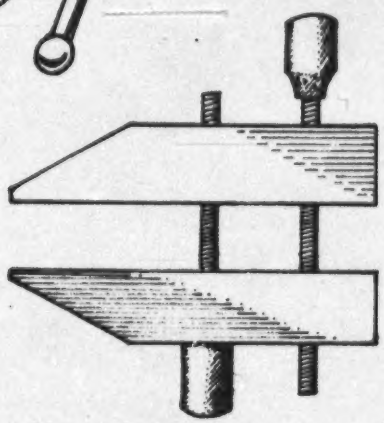




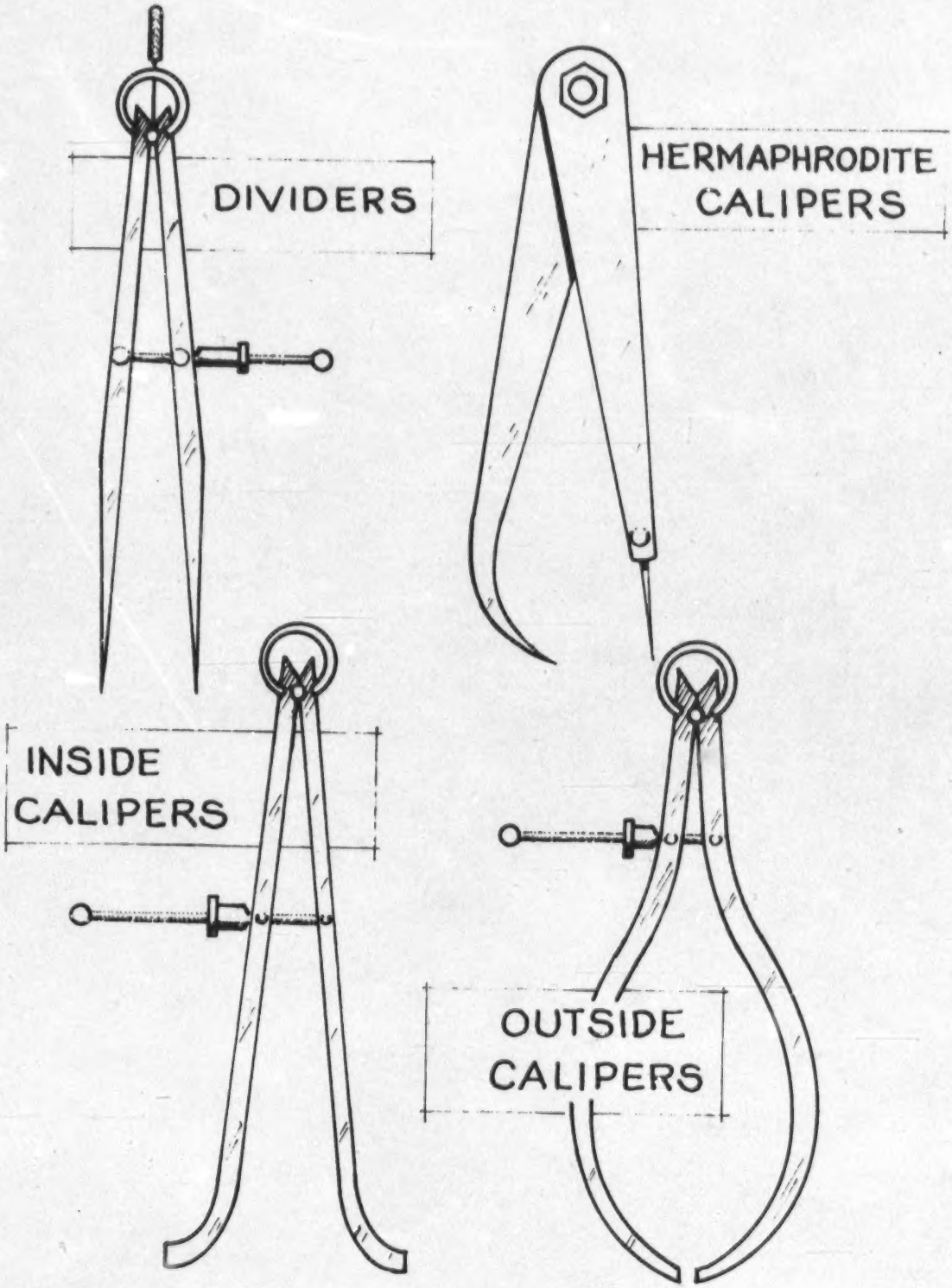
JAW COVERS
(SOFT ALUMINUM
OR COPPER)



C- CLAMP



PARALLEL
CLAMP


DIVIDERS
HERMAPHRODITE CALIPERS
INSIDE CALIPERS
OUTSIDE CALIPERS

Block: Orientation (Maintenance Service) Block I
Job
Lesson: Chassis Lubrication Lesson

Teaching Objective: Upon completion of this lesson, students will be able to describe the factors related to chassis lubrication service.

Teaching Aids: Inspection Samples:
- Fittings
- Ball joints
- Bearings

References: Car Service, Chek Chart Corporation

Outline of Information:

1. Purpose of periodic chassis lubrication

   a. Extends the life of the various automobile components
      -- Road shock tends to damage suspension parts even under normal operating conditions.
      -- Abrasives which find their way into the various bearings tend to prematurely wear them out.
      -- Weather conditions tend to break down the various components by corrosion.

   b. Economical operation of the vehicle is maintained.
      -- The original ride and control is maintained.
      -- Expensive parts replacement is reduced.
      -- High market value of the vehicle is maintained.

   c. Driving safety is assured
      -- Defective components are detected before complete failure.
      -- Fluid levels are brought to proper levels preventing unnecessary malfunctions.

      NOTE: Most modern, American built vehicles have sealed bearings which eliminate the necessity of frequent chassis lubrication services.

OPERATION

Block: Orientation (Maintenance Service) Block I

Job

Operation: Lubricating Chassis Operation

Teaching Objective: To teach students how to lubricate a vehicle chassis

Tools: Air-operated grease gun, hand gun, light oil dispenser

Materials: Wipe cloths, grease fittings, plugs, special oils and lubricants

Teaching Aids: Vehicle Service Chart

References: Vehicle Service Manual

Steps:

1. Raise vehicle off floor

   CAUTION: Carefully check vehicle positioning and lift points. Use correct adapters when using lift to prevent damage.

2. Count the number of fittings used on car being serviced

   NOTE: Lubrication plugs or fittings are shown on the service charts.

3. Check lubrication nozzles to see that they are the type needed for the job

   NOTE: Select proper lubricant.

4. Clean all fittings with a cloth and solvent

5. Apply lube gun to fitting

6. Squeeze trigger and inject lubricant

   CAUTION: Do not allow lubricant to contact disc brake calipers or surface.

7. Proceed to next fitting

   NOTE: Check and lubricate (where necessary) all return and tension springs, all cables and sleeves, sockets, grommets, holding brackets and lamps.

8. Lower vehicle to floor

OPERATION

Block: Orientation (Maintenance Service) Block I

Job

Operation: Inspecting Lubricant and Fluid Levels (Under Hood Access) Operation

---

Teaching Objective: To teach students how to inspect fluid levels

Tools: Screwdriver, hydrometer

Materials: Brake fluid, antifreeze, water, oil, transmission fluid, wipe cloth

Teaching Aids: Charts
- Chassis, General Motors Corporation
- Typical Gear Combinations

References: Vehicle Service Manual
Car Service, Chek Chart Corporation

Steps:

1. Raise hood
2. Check radiator coolant level and freeze protection

   NOTE: Refer to "Testing Cooling System Solution", p. VI-13
3. Check windshield washer level and solvent
4. Check battery electrolyte level and specific gravity

   NOTE: Refer to "Checking the Specific Gravity of the Storage Battery", p. III-83
5. Check power steering fluid level
6. Check steering gear lubricant level
7. Check brake master cylinder fluid
8. Check engine oil level
9. Check automatic transmission fluid level

   NOTE: In proper shift selection, according to manufacturer
10. Check freon in air-condition sight glass

    NOTE: Engine running and air-conditioner operating for approximately 15 minutes

Block: Orientation (Maintenance Service)

Block I
Job
Operation

Operation: Checking and Adding Transmission Fluids and Differential Oils

---

Teaching Objective: To teach the student the proper method of checking and adding transmission fluids

Tools: Oil can opener, transmission funnel with small flexible spout, box wrench, oil pump dispenser

Materials: Proper type of transmission fluid, differential oil, wipe cloths

Teaching Aids: Oil company lubrication charts

References: Car Service, Chek Chart

Steps:

1. Transmission

   a. Start engine and warm up to operating temperature

   b. Place transmission shift lever to part position

   c. Remove dipstick to transmission and wipe clean

   d. Insert dipstick in transmission being sure to push it all the way down

   e. Remove dipstick and read fluid level

   f. Slowly add fluid while repeating checks to avoid overfilling transmission

2. Differential

   a. Jack up vehicle and install safety stands or put car on lift and raise it

      NOTE: Be sure car is level to insure a proper check on lubricant

   b. Remove plug in differential

   c. If oil runs out hole, it is full. If it doesn't, pump in just enough lubricant to fill differential level with hole.

   d. Reinstall plug and lower vehicle

OPERATION

Block: Orientation (Maintenance Service) Block 1
Job
Operation: Lubricating Hinges and Plates Operation

Teaching Objective: To teach students the proper method of lubricating hinges, plates, springs and cables

Tools: Hand grease gun

Materials: Wipe cloth, lubriplate grease

Teaching Aids: Automobile or practice chassis

References: Car Service, Chek Chart Corporation

Steps:

1. Wipe off old lubricant and accumulated dirt with a clean cloth moistened in solvent
2. Open car door and oil hinge pin
3. Put lubriplate grease on stop mechanism
4. Lubricate striker with lubriplate

   NOTE: Wipe excessive grease off of hinge and striker plate
5. Proceed to the next door

Block: Orientation (Maintenance Service) — Block I

Lesson: Importance of Checking Oil Level and Condition — Job ____ Lesson ____

Teaching Objective: Upon completion of this lesson, the students will be able to describe the purpose and procedures of checking engine oil level.

Teaching Aids: Sample dipsticks
Live engine on stand with oil in the crankcase

References: Car Service, Chek Chart Corporation
Motor Oil Guide, American Petroleum Institute

Outline of Information:

1. Purpose of checking with dipstick

   a. Dipstick check provides accurate indication of the amount of oil in the crankcase.

   b. Immediate visual inspection of oil condition

2. Dipstick calibration

   a. Top mark usually indicates that crankcase is filled to capacity.

   b. Second mark indicates oil level is one quart low.

   c. Third mark indicates that oil level is low and the engine should not be operated without the addition of oil.

   NOTE: On some dipsticks with only two marks, the level may register the second mark. This indicates a dangerously low level and requires addition of oil.

3. Types and causes of oil contamination

   a. Dirty oil because of failure to periodically replace the oil or filter

   b. Water droplets or moisture in the oil because of:
      -- Malfunctioning crankcase valve
      -- Coolant entering the crankcase through a defective gasket or a crack into the water jacket in the cylinder head or engine block

4. Results of operating an engine with contaminated or insufficient quantity of oil.

   a. Engine operation with low oil level
      -- Low or no reserve results in a reduction of cooling efficiency.
      -- Lubricating benefits are reduced with insufficient flow capacity.

   b. Engine operation with dirty oil in crankcase
      -- Proper circulation through the lubrication system is reduced.
      -- Cleansing action of the oil is reduced.
      -- Sludge and dirt deposits will accumulate around vital parts.

   c. Engine operation with moisture or water droplets in the oil
      -- Water is not a good lubricant because of the high operating temperatures of the engine bearings (average about 300°).
      -- Presence of moisture or water in the oil is an indication of other engine malfunctions.
      -- Water will cause corrosion to metal parts and destruction of gasket material.

      NOTE: A defective fuel system component could send liquid gasoline into the crankcase. This is a dangerous condition which will damage engine parts. The gasoline and oil mixture could even cause a high oil level reading on the dipstick. Oil in this condition would "feel" very thin when rubbed between the fingers.

OPERATION

Block: Orientation (Maintenance Service) — Block I

Operation: Checking Oil Level and Condition — Job ____ Operation ____

Teaching Objectives: To teach students to accurately check the crankcase oil level and analyze its condition

Materials: Clean wipe cloth or paper towel

Teaching Aids: Automobile or live engine on stand

References: How to Sell Motor Oil, American Petroleum Institute
Car Service, Chek Chart Corporation

Steps:

1. Raise the hood

2. Accurately determine the location of the dipstick

   NOTE: Cars equipped with automatic transmissions are equipped with a dipstick for checking the transmission fluid level. Power steering pump reservoirs are also equipped with a dipstick.

3. Remove the engine oil dipstick, wipe clean and note location of oil level indication marks

   CAUTION: Engine must be stopped and allowed to set for a few minutes to allow time for oil in upper parts of the engine to return to the sump.

4. Insert the clean dipstick fully into the dipstick tube, and withdraw

5. Observe the dipstick

   a. For oil level
      -- Oil clings to the dipstick and indicates the level of oil in the sump.

   b. Observe the oil for contamination
      -- Dirt
      -- Water droplets
      -- Foam

6. Reinstall dipstick

7. Add oil to bring the level up to the safe operating range

   NOTE: Do not overfill; this can cause foaming.

Block: Orientation (Maintenance Service)

Operation: Draining and Refilling Crankcase and Removing and Replacing Oil Filter

Block 1
Job
Operation

Teaching Objective: To teach students to service the engine lubrication system

Tools: Box wrench, oil drain pan, oil spout, and wipe cloths

Materials: Oil

Teaching Aids: Vehicle requiring oil change

References: Automechanics, Glenn, Chapter 3

Steps:

1. Raise vehicle off floor

   CAUTION: Use correct adapters when using lift to prevent damage to car

2. Place drain pan under oil pan

   NOTE: Always drain crankcase while oil is hot

3. Remove crankcase drain plug

4. Unscrew and discard complete filter unit

5. Wipe gasket area on filter base

6. Clean the filter base and the gasket seat

   CAUTION: Be certain that no tiny particles of the old gasket remain to prevent the new gasket from seating.

7. Install new filter

   NOTE: Hand tighten until gasket contacts base, then tighten filter additional 1/2-3/4 or turn specified on filter housing.

8. Replace crankcase drain plug

   CAUTION: Be careful when tightening plug or damage will result.

Draining and Refilling Crankcase and Removing and Replacing Oil Filter (continued)

9. Refill crankcase with specified amount of motor oil

10. Check oil level dipstick after refilling the crankcase

    NOTE: Generally one additional quart of oil is needed when filter is replaced.

11. Start engine and check oil pressure

12. Check for leakage around filter base

Block: Orientation (Maintenance Service) Block 1
Job
Operation: Servicing Front Wheel Bearings Operation

Teaching Objective: To teach students to service front wheel bearings

Tools: Ball pein hammer, drift pin, box wrench (1 1/8"), torque wrench, diagonal pliers, plastic hammer, needle nose pliers

Materials: Wipe cloths, wheel bearing grease, cotter pins

Teaching Aids: Lift point chart

References: Vehicle Service Manual
Car Service, Chek Chart Corporation
Auto Service and Repair, Stockel, Chapter 30

Steps:

1. Check chart for correct lift point, raise front of vehicle and place safety stands
2. Remove hub cap and hub dust cover
3. Remove spindle cotter pin, nut and washer
4. Back off brake shoes if they are contacting drum
5. Shake wheel assembly to free outer bearing and then remove bearing
6. Slide wheel assembly from spindle
7. Place wheel assembly on floor (outside up)
8. Using drift punch (down through hub), drive inner bearing and seal from hub
9. Clean all foreign material from hub and bearings, clean and relube bearings
10. Place bearing into hub, lightly tap new seal flush into back of hub
11. Carefully replace wheel assembly onto spindle. Lube outer bearings

12. Place outer bearing, race, washer and nut onto spindle

13. Remove all slack from bearing, while rotating wheel assembly

    NOTE: Do not overtighten nut. If necessary, to align cotter pin hole, back up nut

14. Readjust brakes, if necessary

15. Replace cotter pin, dust cap and hub cap

16. Perform above steps on remaining side

17. Remove safety stands and lower vehicle to floor

INFORMATION

Block: Orientation (Maintenance Service)

Lesson: Automotive Tires

Block I
Job
Lesson

Teaching Objective: Upon completion of this lesson, students will be able to describe the characteristics of automotive tires in terms of purpose, construction, specifications and care.

Teaching Aids: Movie, 16mm
- Tommy Looks at Tires, B. F. Goodrich Company

References: Automotive Mechanics, Crouse, Chapter 42
Automechanics, Glenn, Chapter 19

Outline of Information:

1. Purpose

   a. Interpose a cushion between the road and the car wheels

   b. Reduce the shock effect to passenger

   c. Provide frictional contact between the wheels and road

2. Types

   a. Solid (used on industrial applications)

   b. Pneumatic (air filled)
      -- Tube type (tube and tire mounted on rim with tube inside the casing)
      -- Tubeless tires (tires are mounted on rim in such a way that air is retained inside without use of tube)

3. Specifications (designations on side wall)

   a. Load range - shows maximum load tire can safely carry

   b. D.O.T. - department of transportation number identifies manufacturer

   c. P.S.I. - shows maximum air pressure that can safely be used in tire

   d. Ply rating - shows type of material used and number of plys

4. Materials used in tire construction

   a. Cords
      -- Nylon, rayon, polyesters, treated natural and synthetic fibers

b. Fabrics
   -- Specially woven from cords
   -- Rubber impregnated fabric

c. Molded body
   -- Natural and/or synthetic rubber
   -- Heat bonded and cured

d. Beads
   -- Specially bonded fibers
   -- High tension steel wire
   -- Molded rubber

e. Belts
   -- Rayon, nylon, polyester, fiber-glass, steel mesh

f. Threads
   -- Rubber, synthetics
   -- Reinforced with steel, fiber-glass, cleats, etc., (for special uses)

5. Inflation

a. Low pressure
   -- Excessive wear to outside areas of tread
   -- Excessive flexing of side walls results in ply separation.
   -- Rim damage, ply breakage and early tire failure

b. Excessive pressure
   -- Uneven tread wear in center
   -- Hard ride and subject to early rupture
   -- Fabric takes the shock and cannot give or flex.

c. Uneven pressure causes car to pull to one side.

Caution: Do not inflate tires when they are hot. Pressures specified by the manufacturers are for cold tires and increases in temperature will increase air pressure.

OPERATION

Block: Orientation (Maintenance Service) Block I
Job
Operation: Repairing Tires Operation

Teaching Objective: To teach students to repair tires

Tools: Wipe cloths, tire changer, valve core remover, scraper or buffer, needle

Materials: Patching, solvent, glue, plugs

Teaching Aids: Wheel, tire, tube assembly, valve assembly

References: Automotive Mechanics, Crouse, Chapter 42

Steps:

1. Tube-type
   a. Install tire in changer
   b. Break beads from wheel
   c. Remove tire and tube from wheel
   d. Check tube for leak
   e. Buff area around hole
   f. Apply cement
   g. Apply patch
   h. Check tire for cause of puncture
   i. Reinstall tire and tube
   j. Inflate and check for leaks
2. Tubeless
   a. Locate leak in tire by applying soap and watching for bubbles
   b. Clean hole with buffer dipped in solvent
   c. Install plug in needle
   d. Install plug in tire
   e. Inflate and check for leaks

OPERATION

Block: Orientation (Maintenance Service) Block I

Operation: Changing Tires Job

Operation

Teaching Objective: To teach students how to change automobile tires

Tools: Wipe cloths, tire changer, valve core remover

Materials: Rubber lubricant

Teaching Aids: Tire, wheel, tube or valve assembly

References: Automotive Mechanics, Crouse, Chapter 42

Steps:

1. Mount wheel on tire changer
2. Remove valve core
3. Break outside bead loose from rim
4. Break inside bead loose from rim
5. Remove outside bead from rim
6. Remove tire from rim
7. Lubricate tire and rim
8. Install tire on rim
9. Inflate tire
10. Check for leaks
11. Remove tire from changer

NOTE: All 14 inch tires must be removed from back of rim.

References - Block I

Books and Texts

1. Crouse, William H. Automotive Mechanics, 6th ed. St. Louis: McGraw-Hill, 1970.

2. Feingold and Swerdloff. Occupations and Careers. New York: McGraw-Hill, 1969.

3. Glenn, Harold T. Automechanics, 2nd ed. Peoria, Illinois: Charles A. Bennett Company, Incorporated, 1962.

4. Lerner, Lillian, and Margaret Moller. John Leveron, Auto Mechanic. Chicago: Follett Publishing Company, 1965.

5. Occupational Outlook Handbook, 1972-73 Edition. Bureau of Labor Statistics, U.S. Government Printing Office.

6. Silvius, Harold G., and Estill H. Curry. Managing Multiple Activities In Industrial Education. Bloomington, Illinois: McKnight and McKnight Publishing Company, 1971.

7. Stocket, Martin W. Auto Service and Repair. Homewood, Illinois: The Goodheart-Wilcox Co., Inc., 1969.

Other Publications (Manuals, Bulletins, Booklets)

1. "Accident Prevention Program for School Shops." National Safety Council.

2. "Automotive Service Occupations." Albany, New York: Curriculum Development Center, State University, 1968.

3. "Building a Future in a Business of Your Own." American Petroleum Institute, 1967.

4. "Car Service." Chicago: Chek Chart Corporation.

5. "The Costs of Running a Car." New York: Grolier Education Corporation, 1970.

6. "How to Sell Motor Oil." Lubrication Committee, American Petroleum Institute, 1969.

7. "Industrial Education Shop Planning Packet." Powermatic Division of Houdialle Industries.

8. "Motor Oil Guide." New York: Manufacturing Division, American Petroleum Institute.

Other Publications (Manuals, Bulletins, Booklets)

9. "Owner Relations Action Guide." Detroit: General Motors Corporation.

10. "Vehicle Service Manual." (Refer to appropriate manual for vehicle)